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EXAMINER

KAO, CHIH CHENG G

ART UNIT PAPER NUMBER

2882

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/700,439

Applicant(s)

SCHWARTE, RUDOLF

Examiner

Chih-Cheng Glen Kao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 08 October 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☒ Claim(s) 1-15, 17, 18 and 21-24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 17 October 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION*****Specification***

1. The disclosure is objected to because of the following informalities: On page 19, line 21, “ $(|i_a - i_b| - |i_c - i_d|)$ ” has a mathematical error with regards to the extra “).”. This objection may be obviated by deleting “ $(|i_a - i_b| - |i_c - i_d|)$ ” and inserting  $--(|i_a - i_b| - |i_c - i_d|) --$ . Appropriate correction is required.

2. The disclosure is objected to because of the following informalities: On page 19, line 25, “ $(|i_a - i_b| - |i_c - i_d|)$ ” has mathematical errors with regards to the extra “).” and the minus sign between the two terms of the mathematical expression (note “the sum of the differences” as recited in line 24). This objection may be obviated by deleting “ $(|i_a - i_b| - |i_c - i_d|)$ ”, and inserting  $--(|i_a - i_b| + |i_c - i_d|) --$ . Appropriate correction is required.

***Drawings***

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “covering by a contacting strip” of claim 7 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “octahedron shape” of claim 12 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

5. Although the proposed drawings have been acknowledged by the examiner, the applicant is advised to file separate formal drawings as a separate paper with a transmittal letter addressed to the Official Draftsperson.

**Note Correction of Informalities -- 37 CFR 1.85**

New corrected drawings must be filed with the changes incorporated therein. Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and centered within the top margin. If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings **MUST** be filed within the **THREE MONTH** shortened statutory period set for reply in the “Notice of Allowability.” Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

***Claim Objections***

6. Claim 1 is objected to because of the following informalities: Claim 1 recites the limitation "the preferably constant potential" in line 9. There is insufficient antecedent basis for

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this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- - . For purposes of examination, the claim has been treated as such. Appropriate correction is required.

7. Claim 1 is objected to because of the following informalities: Claim 1 recites the limitation "the cathode" in line 14. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

8. Claim 1 is objected to because of the following informalities: There is a missing comma in line 5, after “photogates”. Inserting a comma after “photogates” will correct the grammatical error. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

9. Claim 2 is objected to because of the following informalities: Claim 2 recites the limitation "the preferably constant potential" in line 9. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- - . For purposes of examination, the claim has been treated as such. Appropriate correction is required.

10. Claim 2 is objected to because of the following informalities: Claim 2 recites the limitation "the cathode" in line 13. There is insufficient antecedent basis for this limitation in the

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claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

11. Claim 3 is objected to because of the following informalities: Claim 3 recites the limitation "the wavelength" in line 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

12. Claim 3 is objected to because of the following informalities: Claim 3 recites the limitation "the individual modulation photogates" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “individual”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

13. Claim 3 is objected to because of the following informalities: Claim 3 recites the limitation "the electromagnetic radiation" in lines 3-4. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “radiation” and inserting - -waves- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

14. Claim 3 is objected to because of various grammatical errors: Claim 3 recites the limitation "or in particular for the remote infrared range also less” in lines 2-3. This objection

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may be obviated by inserting a comma before “in”, deleting “also”, and inserting a comma before “less”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

15. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 recites electromagnetic waves in the optical and in the near infrared and ultraviolet range. However, Claim 3 does not further limit the subject matter of the previous claim with the remote infrared range. It broadens the subject matter.

16. Claim 4 is objected to because of the following informalities: Claim 4 recites the limitation "the strip length" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

17. Claim 4 is objected to because of the following informalities: Claim 4 recites the limitation "the electromagnetic radiation" in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “radiation” and inserting - -waves- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

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18. Claim 5 is objected to because of a minor error: In line 1, after “claims 2”, the word “through]” is misspelled. This objection may be obviated by deleting “through]” and inserting -through- -. Appropriate correction is required.

19. Claim 5 is objected to because of the following informalities: Claim 5 recites the limitation “the modulation connections” in lines 8-9. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “connections” and inserting -connection- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

20. Claim 7 is objected to because of the following informalities: Claim 7 recites the limitation “the side” in lines 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

21. Claim 8 is objected to because of the following informalities: Claim 8 recites the limitation “the strip directions” in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

22. Claim 9 is objected to because of the following informalities: Claim 9 recites the limitation “the accumulation gate connections” in lines 1-2. There is insufficient antecedent



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basis for this limitation in the claim. This objection may be obviated by inserting - -electrical connections for the- - before “accumulation gate” and deleting “connections” after “gate”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

23. Claim 9 is objected to because of the following informalities: Claim 9 recites the limitation “the connection lines” in lines 4-5. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “connection lines” and inserting - -reading-out lines- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

24. Claim 9 is objected to because of the following informalities: Claim 9 recites the limitation “the reading-out lines” in lines 5. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by inserting - -two- - after “the”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

25. Claim 10 is objected to because of the following informalities: Claim 10 recites the limitation “the mutually immediately adjacent modulation photogates” in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

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26. Claim 10 is objected to because of the following informalities: Claim 10 recites the limitation "the mutually juxtaposed ends" in lines 4. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

27. Claim 10 is objected to because of the following informalities: Claim 10 recites the limitation "double the size" in lines 6. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by inserting - -of one of the two pixel elements". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

28. Claim 11 is objected to because of the following informalities: Claim 11 recites the limitation "the pixels" in lines 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting - -elements- - after "pixels". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

29. Claim 11 is objected to because of the following informalities: Claim 11 recites the limitation "the immediately adjacent pixel elements" in lines 4. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

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30. Claim 11 is objected to because of the following informalities: Claim 11 recites the limitation "the modulation connections" in lines 5. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

31. Claim 12 is objected to because of the following informalities: Claim 12 recites the limitation "each of the pixel elements" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by inserting - -four- - before "pixel". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

32. Claim 12 is objected to because of the following informalities: Claim 12 recites the limitation "the corners" in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by inserting - -of the four pixel elements- - after "corners". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

33. Claim 13 is objected to because of the following informalities: Claim 13 recites the limitation "4quadrant" in lines 4. This objection may be obviated by deleting "4quadrant" and inserting -- 4-quadrant -- as claimed in line 3 of claim 13. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

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34. Claim 13 is objected to because of the following informalities: Claim 13 recites the limitation "the surface element" in lines 5. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "element" and inserting - of the four pixel elements- - after "surface". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

35. Claim 14 is objected to because of the following informalities: Claim 14 recites the limitation "the associated signal evaluation peripheral equipment" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

36. Claim 15 is objected to because of the following informalities: Claim 15 recites the limitation "the light" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "light" and inserting - electromagnetic waves- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

37. Claim 15 is objected to because of the following informalities: Claim 15 recites the limitation "'pixel" in lines 3, which is misspelled. This objection may be obviated by deleting "'pixel" and inserting - pixel- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

38. Claim 17 is objected to because of the following grammatical informalities: Claim 17 recites the limitation “array both PMD-pixels with 3D-functionality and also conventional CMOS-pixels with 2D-functinoality” in lines 2-3. This objection may be obviated by inserting - - has - - after “array” and deleting “are”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

39. Claim 17 is objected to because of the following informalities: Claim 17 recites the limitation “the various” in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

40. Claim 17 is objected to because of the following informalities: Claim 17 recites the limitation “the depth image” in lines 5. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

41. Claim 18 is objected to because of the following informalities: Claim 18 recites the limitation “the light” in lines 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “light” and inserting - -electromagnetic waves- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

42. Claim 18 is objected to because of the following informalities: Claim 18 recites the limitation "the individual pixels" in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the", deleting "pixels", and inserting - -PMD-pixels- - after "individual". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

43. Claim 21 is objected to because of the following informalities: Claim 21 recites the limitation "the same but now" in lines 4. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the same but now". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

44. Claim 21 is objected to because of the following grammatical informalities: Claim 21 recites the limitation "selectively for half of a 2-quadrant or 4-quadrant pixel of the pixels" in lines 4-5. Commas are needed. This objection may be obviated by adding a comma before "selectively" and adding a comma after "pixels". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

45. Claim 21 is objected to because of the following informalities: Claim 21 recites the limitation "the modulation photogate voltages" in lines 7. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "voltages" and

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inserting - -potentials- -. For purposes of examination, the claim has been treated as such.

Appropriate correction is required.

46. Claim 22 is objected to because of the following informalities: Claim 22 recites the limitation "the regeneration of data signals" in lines 5. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

47. Claim 23 objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only. See MPEP § 608.01(n). This objection may be obviated by inserting - -any- - after "one". For purposes of examination, the claim has been treated as such. Appropriate correction is required.

48. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation "the difference output voltage" in lines 5-6. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

49. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation "the difference of the quantitative differences" in lines 6. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting the

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first “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such.

Appropriate correction is required.

50. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “the quantitative differences” in lines 6. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

51. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “the photocurrents” in lines 6-7. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

52. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “the voltage-controlled multivibrator” in lines 7. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

53. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “the chip frequency” in lines 8-9. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -.



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For purposes of examination, the claim has been treated as such. Appropriate correction is required.

54. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation "the data signal" in lines 9. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting -a-. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

55. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation " the PN-encoded 1/0-data sequence" in lines 9. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting -a-. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

56. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation "the recovered word clock" in lines 10. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting -a-. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

57. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation "the summing amplifier" in lines 10-11. There is insufficient antecedent basis for this

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limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

58. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “the sum” in lines 11. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -a- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

59. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “the photocurrents  $U_{\Sigma}$ ” in lines 11. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the” and inserting - -as- - after “photocurrents”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

60. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “ $(|i_a - i_b| - |i_c - i_d|)$ ” in line 7, which has a mathematical error with regards to the extra “)”. This objection may be obviated by deleting “ $(|i_a - i_b| - |i_c - i_d|)$ ” and inserting - -  $(|i_a - i_b| - |i_c - i_d|)$  - -. Appropriate correction is required.

61. Claim 23 is objected to because of the following informalities: Claim 23 recites the limitation “ $(|i_a - i_b| - |i_c - i_d|)$ ” in lines 11-12, which has a mathematical error with regards to

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the extra “)” and the minus sign between the two terms of the mathematical expression (note “the sum of the differences” as recited in line 11). This objection may be obviated by deleting “( |  $i_a - i_b$  ) | - |  $i_c - i_d$  | )”, and inserting - - ( |  $i_a - i_b$  ) | + |  $i_c - i_d$  | ) - -. Appropriate correction is required.

62. Claim 24 is objected to because of the following informalities: Claim 24 recites the limitation “the light” in lines 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “light” and inserting - -electromagnetic waves- -. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

63. Claim 24 is objected to because of the following informalities: Claim 24 recites the limitation “the individual pixels” in lines 3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting “the”, deleting “pixels”, and inserting - -PMD-pixels- - after “individual”. For purposes of examination, the claim has been treated as such. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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64. Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

65. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949).

In the present instance, claim 1 recites the broad recitation, "electromagnetic waves", and the claim also recites "preferably in the optical and in the near infrared and ultraviolet range", which is the narrower statement of the range/limitation.

Claim 1 also recites the broad recitation, "potential of the modulation photogates", and the claim also recites "and relative to the preferably constant potential of the accumulation gates

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(4,5) corresponding to a desired modulation function”, which is the narrower statement of the range/limitation.

Claim 1 also recites the broad recitation, “accumulation gates are in the form of reading-out diodes”, and the claim also recites “with preferably in each case the cathode as the reading-out electrode”, which is the narrower statement of the range/limitation.

Claim 2 recites the broad recitation, “electromagnetic waves”, and the claim also recites “preferably in the optical and in the near infrared and ultraviolet range”, which is the narrower statement of the range/limitation.

Claim 2 also recites the broad recitation, “potential of the modulation photogates”, and the claim also recites “and relative to the preferably constant potential of the accumulation gates (4,5) corresponding to a desired modulation function”, which is the narrower statement of the range/limitation.

Claim 2 also recites the broad recitation, “accumulation gates are in the form of reading-out diodes”, and the claim also recites “with preferably in each case the cathode as the reading-out electrode”, which is the narrower statement of the range/limitation.

Claim 4 recites the broad recitation, “more than ten times”, and the claim also recites “and preferably more than fifty times”, which is the narrower statement of the range/limitation.

Claim 8 recites the broad recitation, “strip directions”, and the claim also recites “are preferably perpendicular to each other and wherein transversely with respect to the strip direction

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the ends of the pixels are defined by at least one respective modulation photogate (1,2) which adjoins a next inwardly disposed accumulation gate (4,5)", which is the narrower statement of the range/limitation.

Claim 11 recites the broad recitation, "adjacent pixel elements (10) can be effected in phase-shifted relationship", and the claim also recites "more specifically preferably through 90° in each case", which is the narrower statement of the range/limitation.

Claim 18 recites the broad recitation, "Apparatus as set forth in claim 17 characterized in that", and the claim also recites "preferably there is associated with each said PMD-pixel a microlens which concentrates the light incident on the array substantially on to the photosensitive surface of the individual pixels", which is the narrower statement of the range/limitation.

Claim 22 recites the broad recitation, "the apparatus is used in an optical PLL-circuit or DLL-circuit", and the claim also recites "which is preferably highly integrated and is preferably used in light barrier arrangements", which is the narrower statement of the range/limitation.

Claim 24 recites the broad recitation, "Apparatus as set forth in claim 16 characterized in that", and the claim also recites "preferably there is associated with each said PMD-pixel a microlens which concentrates the light incident on the array substantially on to the

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photosensitive surface of the individual pixels”, which is the narrower statement of the range/limitation.

These rejections may all be obviated by deleting the word “preferably” and correcting for any grammatical errors that may result from such a deletion. For purposes of examination, the claims have been treated as such. Appropriate correction is required.

66. Regarding claim 9, the phrase "for example" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d). This rejection may be obviated by deleting “for example” and inserting - - corresponding to- -. For purposes of examination, the claim will be treated as such. Appropriate correction is required.

67. Regarding claim 10, the phrase "for example" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d). This rejection may be obviated by deleting “for example”. For purposes of examination, the claim will be treated as such. Appropriate correction is required.

68. Regarding claim 17, the phrase "in particular” renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. This rejection may be obviated by deleting “in particular”. For purposes of examination, the claim will be treated as such. Appropriate correction is required.

69. Regarding claim 23, the phrase "in particular" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. This rejection may be obviated by deleting "in particular". For purposes of examination, the claim will be treated as such. Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

70. Claims 1-9, 14, 16, 17, and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarte (WO 98/10255) in view of Erhardt (US Patent 5051797) and Lambeth (US Patent 4826312).

71. Regarding claims 1, 2, 5-7, 14, 16, 17, and 19-23, Schwarte discloses an apparatus for detecting phase and amplitude of electromagnetic waves (Title) comprising: at least two photosensitive modulation photogates, paired and parallel (Fig. 6, "G<sub>am</sub>" and "G<sub>bm</sub>") and arranged at substantially equal spacing (Fig. 7 and 13) in a push-pull relationship (Page 5, lines 20-27), and accumulation gates (Fig. 6, "G<sub>a</sub>" and "G<sub>b</sub>"), arranged between pairs of photogates (Fig. 7) in parallel strips (Fig. 8, "G<sub>a</sub>" and "G<sub>b</sub>") and connected to a reading-out device (Fig. 13,



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#15) and modulating device to increase or reduce potential of the modulation photogates (Fig. 12, #11, “+Um(t)”, and “-Um(t)”) wherein the accumulation gates are in the form of reading-out diodes (Fig. 13, #2 and “n+” connected to “Ga” and “Gb”) to form a PMD-pixel (Abstract, last sentence) in linear or matrix array (Claim 22) and the cathode as the reading out electrode (Fig. 13) with the width of the modulation gates greater than the accumulation gates (Fig. 13), a covering by a contact of high conductivity and very low transparency of electromagnetic waves (Fig. 13, electrode of “Ga” and “Gb” above the “n+” material), pixel elements (Fig. 2) which can have a plurality of pairs of modulation gates and accumulation gates (Fig. 14), wherein strip directions are perpendicular to each other (Fig. 14 and 2), and wherein PMD and CMOS pixels may be mixed for a depth image (Page 17, col. 6-10), a 3D and 2D functionality together with a data-fusioning and interpolating device for a depth image (Page 17, col. 12-17 and 26-30), wherein an image is illuminated by a modulation function with the photogates in push-pull, and half of the pixels are  $90^0$  phase-shifted in the case of sine modulation (Figs. 11 and 12).

However, Schwarte does not disclose accumulation gates being neither photosensitive nor shaded nor strips for photogates.

Erhardt teaches accumulation gates neither photosensitive nor shaded (Fig. 2, #34, and col. 3, lines 21-30). Lambeth teaches strips for photogates (Fig. 1).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the accumulation gates of Erhardt with the apparatus of Schwarte, since one would be motivated have these neither photosensitive for anti-blooming capability with good quantum efficiency as implied from Erhardt (col. 1, lines 54-57, and col. 2, lines 62-69 to col. 3, lines 1-2).

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It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the photogates of Lambeth with the suggested apparatus of Schwarte in view of Erhardt, since one would be motivated to have a relatively large light sensitive area and a relatively low capacitance to better control the spill and fill process as shown by Lambeth (col. 2, lines 55-65).

Note that it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have an electrode as a cathode with the device of Schwarte, since rearranging parts of an invention involves only routine skill in the art. One can routinely make the electrode connection on the cathode or anode side, which would only be a matter of engineering efficiency, to effectively control the flow of electricity will from the gate to the reading-out device.

Also note that with regards to claim 14, the method of forming a device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight.

With regards to claims 19, 20, 22, and 23, a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitation.

72. Regarding claim 3, Schwarte in view of Erhardt and Lambeth suggests an apparatus as recited above.

However, Schwarte does not seem to specifically disclose the width in the order of magnitude of a wavelength.

Lambeth further teaches photogates having a size and shape similar to the size and shape of the beam cross section (col. 2, lines 45-50), which in the case of Schwarte is a wavelength of the electromagnetic wave.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the width in the order of magnitude of a wavelength of Lambeth with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since one would be motivated to optimize the signal-to-noise ratio as shown by Lambeth (col. 2, lines 45-46).

Secondly, it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the width in the order of magnitude of a wavelength with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would be motivated to have the width of the photodetector in the order of magnitude of a wavelength, since if the photodetector was smaller than the wavelength, it would possibly not be able to detect the electromagnetic radiation.

73. Regarding claim 4, Schwarte in view of Erhardt and Lambeth suggests an apparatus as recited above. Schwarte further discloses the length of the photogates and gates as more than 10 times the wavelength of radiation (Fig. 13).

However, Schwarte does not seem to specifically disclose a strip length of the photogates.

Lambeth further teaches a strip length of photogates (Fig. 1).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the strip length of photogates of Lambeth with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since one would be motivated to have a relatively large light sensitive area and a relatively low capacitance to better control the spill and fill process as shown by Lambeth (col. 2, lines 55-65).

Secondly, it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the length 10 times or 50 times the wavelength of the radiation, with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would be motivated to have the length large to ensure that the photodetector detects the radiation as implied from Lambeth (col. 2, lines 55-65).

74. Regarding claims 8 and 9, Schwarte in view of Erhardt and Lambeth suggests an apparatus as recited above. Schwarte further discloses two reading-out lines from the accumulation gates to an evaluation circuit (Fig. 13, #15,  $G_a$ , and  $G_b$ ).

However, Schwarte does not disclose ends of pixels defined by a photogate adjoining an accumulation gate.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have ends of pixels defined by a photogate adjoining an accumulation gate with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since

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rearranging parts of an invention involves only routine skill in the art. One would be motivated to have this arrangement to make the apparatus smaller.

75. Regarding claim 11, Schwarte in view of Erhardt and Lambeth suggests an apparatus as recited above.

However, Schwarte does not disclose ends of pixels defined by a photogate adjoining an accumulation gate.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have ends of pixels defined by a photogate adjoining an accumulation gate with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since rearranging parts of an invention involves only routine skill in the art. One would be motivated to have this arrangement to make the apparatus smaller.

76. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarte in view of Erhardt and Lambeth as applied to claim 8 above, and further in view of Takahashi (US Patent 5955753).

Schwarte in view of Erhardt and Lambeth suggests an apparatus as recited above. Schwarte further teaches modulation in  $90^0$  phase-shifted relationship (Page 29, lines 16-26) and pixels in a rectangle with strips diagonal, extending parallel (Fig. 2 and 14).

However, Schwarte does not specifically disclose the strips in directly mutually juxtaposed relationship so that mutually immediately adjacent photogates defining ends or sides of the two pixels form a pair of photogates and whereby either a single pixel element of double

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the size of a single pixel is formed with the two pixels, nor four pixels in a rectangle or square so that strips in diagonally opposite pixels are parallel while strips that are adjacent are perpendicular.

Takahashi teaches a single pixel element of double the size of a single pixel formed with two pixels (Fig. 2), which can be but in four pixels as a rectangle or square (Fig. 1).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to double size of Takahashi with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since one would be motivated to use it to reduce the number of pixels (col. 2 lines 24-29) and have multi-functions for addition and non-addition (col. 2, lines 38-42) as implied from Takahashi.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to the strips in directly mutually juxtaposed relationship so that mutually immediately adjacent photogates defining ends or sides of the two pixels form a pair of photogates with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since rearranging parts of an invention involves only routine skill in the art. One would be motivated to have this arrangement to make the apparatus smaller.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the strips in diagonally opposite pixels are parallel while strips that are adjacent are perpendicular, with the suggested apparatus of Schwarte in view of Erhardt, Lambeth, and Takahashi, since rearranging parts of an invention involves only routine skill in the art. If one employed the pixel of Schwarte (Fig. 14 or 8) into the array of pixels of

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Takahashi (Fig. 1) or Schwarte (Fig. 11, #8), one would have the configuration. One would be motivated to have this configuration to conserve space.

Also note it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have ends of pixels defined by a photogate adjoining an accumulation gate with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since rearranging parts of an invention involves only routine skill in the art. One would be motivated to have this arrangement to make the apparatus smaller.

77. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarte in view of Erhardt, Lambeth, and Takahashi as applied to claim 12 above, and further in view of Wilder et al. (US Patent 5262871).

Schwarte in view of Erhardt, Lambeth, and Takahashi suggests an apparatus as recited above.

However, Schwarte does not specifically disclose pixels combined individually, or doubly, or in quadruple relationship.

Wilder et al. teaches pixels combined in any varying number of relationships (Abstract, lines 1-8).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to combine pixels of Wilder et al. in a quadruple relationship with the suggested apparatus of Schwarte in view of Erhardt, Lambeth, and Takahashi, since where the general conditions of a claim are disclosed in the prior art, discovering the optimum or

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workable ranges involves only routine skill in the art. One would be motivated to combine the pixels to provide high speed data capture as implied from Wilder et al. (Abstract).

78. Claims 15, 18, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarte in view of Erhardt and Lambeth as applied to claims 2 and 16 above, and further in view of Wilwerding (US Patent 4812640) and Matsumoto (US Patent 5420634).

Schwarte in view of Erhardt and Lambeth suggests an apparatus as recited above.

However, Schwarte does not disclose strip lenses or microlenses to focus substantially all light exclusively on photogates.

Matsumoto teaches microlenses focusing substantially all light exclusively on photogates (Fig. 3). Wilwerding teaches strip lenses (Fig. 1, #33).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have microlenses focusing substantially all light exclusively on photogates of Matsumoto with the suggested apparatus of Schwarte in view of Erhardt and Lambeth, since one would be motivated to ensure that the light or entire image signal reaches the photogate as implied from Matsumoto (Fig. 3).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to the strip lens of Wilwerding with the suggested apparatus of Schwarte in view of Erhardt, Lambeth, and Matsumoto, since Wilwerding shows that strips lenses and round lenses are equivalent structures known in the art, in that they are both lenses. Since there two elements were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute the strip lenses for the round lenses.



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One would be motivated to use the strip lens based on the shape of the elements that the lens directs light to as implied from Wilwerding (Fig. 1).

***Allowable Subject Matter***

79. The indicated allowability of claims 2, 5, 6, 8-18, 22, and 23 are withdrawn in view of the newly discovered reference(s) to Takahashi, Erhardt, Wilder et al., Wilwerding, and Matsumoto. Rejections based on the newly cited reference(s) are as recited above.

***Response to Arguments***

80. Applicant's arguments with respect to claims 1-24 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (703) 605-5298. The examiner can normally be reached on M - Th (8 am to 5 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the

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organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



gk

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